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MALARIA AND TETANUS:

TURNING BACK THE TIDE

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The editorial committee for CONTACT consists of: Stuart Kingma, Director and Editor, Miriam Reidy, Editorial Assistant and Heidi Schweizer, Administrative Assistant. The rest of CMC staff also participate actively in choosing topics for emphasis and the development of materials: Eric Ram and Cécile De Sweemer, Associate Directors, Jeanne Nemec, Secretary for Studies, Melita Wall, Consultant. Fernande Chandrasekharan, Secretary, is responsible for the CONTACT mailing list, assisted by Valerie Medri and Minnie Carles-Tolra, Secretaries. CONTACT is printed by Imprimerie Arduino, 1224 Chêne-Bougeries/Geneva, Switzerland.

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Editorial Note:

It is often extremely difficult for health workers to decide how best to apply their technical knowledge and skills and their wish and capacity to care for others. Since all the resources at their disposal—time, personal energy, material resources—are limited, a real effort in careful planning and making deliberate choices is required. It is just this process of planning that has led to the evolution of a community focus on health care, the increasing emphasis on people's participation in health care and the other features of what we now call primary health care. The process goes on at a micro level for each health worker and the limited population which she or he serves; the corresponding process goes on at the district and national levels for the allocation of resources for health and medical care.

This approach means that we must go beyond simply responding to the demands for care made by people who come to us with a specific health problem. Allocation of time and resources must be deliberately calculated to achieve the greatest impact on the community's level of wellbeing. To focus exclusively on the line of people arriving each day at a health post means to ignore those who do not come, whose health could be promoted and who could themselves be drawn into that process of health promotion if someone could take the time and give them the skills to do so. The partnership in disease prevention and health promotion between health workers, the family and the community must, necessarily, focus on specific health questions and diseases as well as more general matters like safe water, good nutrition and sanitation.

Concern for specific disease problems in particular communities or countries has led to a variety of responses. One such response has been the development of single-focus efforts which address particular diseases or a single set of interventions. This "vertical" approach was popularized in many parts of the world in the first two decades after World War II. Many countries saw a proliferation of single-function health workers, trained to address such areas as family planning, vaccination, smallpox, malaria, tuberculosis, leprosy and the like. Over the last 20 years, as health services grew, as the tasks assigned to community-level workers expanded in number and as the rationalization for the integrated and comprehensive approach at each level became clearer, the evolution of multi-purpose workers accelerated. Many countries retrained large numbers of their single-function workers to become more generalist as community health workers. Vertical programmes became more the exception than the rule. Today, degrees of specialization justifiably persist as special skills are required by the needs of a particular time or population group.

The spectacular success of the worldwide smallpox eradication campaign, concluded in 1981, has put a new gleam in the eye of those who advocate such a vertical approach. The careful research which showed that the goal of complete eradication was feasible for smallpox permitted the various agencies and governments to devote the necessary resources and, in the end, was totally justified. The peculiar biological nature of smallpox and its transmission made eradication possible. The search for other diseases which might respond to similar efforts is being pursued but, at this moment, it seems that few diseases would, by their very nature, be amenable to such an approach. We have a number of lessons from the past to help us in reaching such a conclusion. The massive measles vaccination campaign in West Africa of some years ago did indeed result in a dramatic drop in measles incidence for some years. However, the recrudescence of endemic

measles has shown that the infrastructure and follow-up were not adequate to sustain the successes achieved. The malaria eradication efforts of earlier decades provide another example. In certain, limited, geographic areas, it was possible to eliminate or reduce malaria to exceedingly low levels. But, for the large land masses of Africa, Asia and Latin America, malaria is once again on the march, with a number of disturbing new elements.

In this issue of CONTACT, we look at two major diseases which take a heavy toll in tropical countries: malaria and tetanus. They have been singled out for discussion because they are faced so commonly by health workers around the world, and because their situation has changed and continues to change Clearly, it is not our intention to advocate a narrowed focus on these two diseases. Rather, we wish to contribute to the management of these diseases **within the context of primary health care**.

For malaria, the problem is rapid acceleration in incidence, to hyperendemic and epidemic levels in many areas, coupled with growing drug resistance of both the mosquito vector and of the malaria organism itself. The toll in morbidity and mortality grows more alarming each year. For tetanus, the focus is somewhat different. There is no resistance problem since the tetanus vaccines are among the most effective and hardy, and their protection long-lasting and sure. It is, therefore, easier to evaluate the results of vaccination and other programmes which combat tetanus and to clearly present the latest recommendations in this regard. Neonatal tetanus, however, (that is, tetanus which appears within the first 2 or 3 weeks of life and which enters by way of the umbilical cord), is one of the most under-reported diseases in the world. It has been so common in certain societies that children are not considered to be alive, human and worth naming until they have survived the 2 or 4 weeks of neonatal tetanus risk. Thus, many who die are simply and quietly put aside and remain uncounted. The annual global death toll is far beyond our capacity to measure or even estimate, but must clearly be in the millions annually.

A renewed effort to deal with these two diseases depends on national health programme planning and emphasis directed towards this goal. These need to be matched by integration and coordination of initiatives taken by communities, non-governmental organizations and other interested agencies at all levels. Also demanded are new efforts in public health education to ensure that health system activities are backed up by full community participation in the truest sense. To control these two devastating disease problems means reversing a worldwide trend most dramatically seen in the world malaria situation. Greater resources may need to be directed and some of the hard decisions about resource allocations may need to be made if this end is to be achieved.

This issue of CONTACT, prepared by CMC staff with specific contributions by Stuart Kingma, Cécile De Sweemer, Melita Wall and Miriam Reidy, is one small effort to help in that cause.

* * *

MALARIA AND TETANUS: TURNING BACK THE TIDE

TETANUS

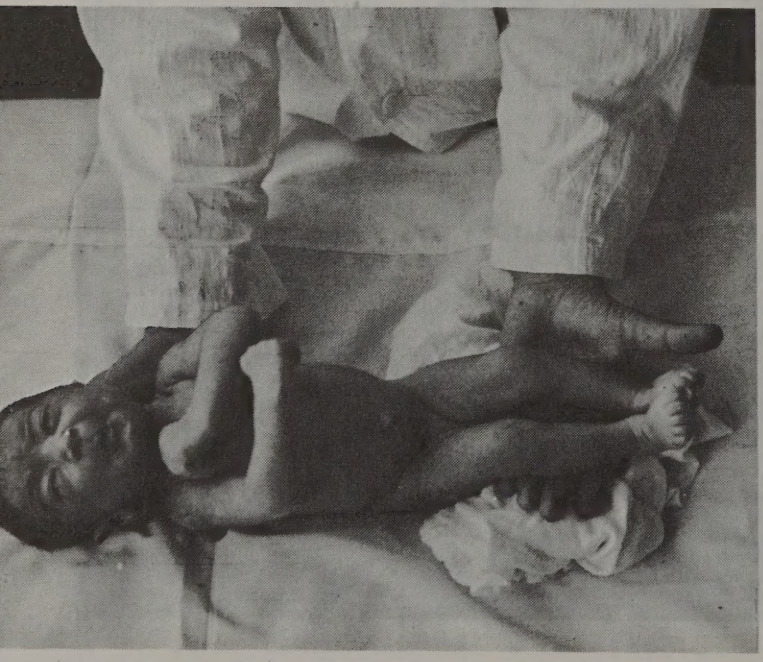
Tetanus continues to be a dreaded disease in developing countries. Most languages have popular names for it which describe the painful contractions of the muscles, especially of the jaw and neck, or which ascribe supernatural causes to the disease such as, for example, the name *takuria* ("evil-eye") in Bengali. In village discussions of health problems, tetanus is not always mentioned because it may be considered a spiritual problem. But experiences in Africa, Asia, Latin America and the Pacific have shown that, when health workers seek information on tetanus incidence, villagers not only recognize the disease and its dangers but also spontaneously and correctly identify the major groups at risk within their own society.

WHO Photo by P. Harrison

A frightened farmer carries his wife, stricken with tetanus, to the People's Health Centre in Savar, Bangladesh.

Epidemiology

Risk of exposure to tetanus of different groups within a community varies greatly from one place to another. Thus, broad generalizations about the epidemiology of tetanus in developing countries are likely to be misleading. In West Africa, for example, the high-risk groups named by villagers are newborns, cattle-herders, farmers and fishermen. This perception is supported by statistics from Mali (from health facilities in Sikasso) which show that only 30 percent of all tetanus cases seen are under one month of age while males over 15 years account for another 30 percent, and 40 percent are children of both sexes between one and 15 years.[1] On the Indian Subcontinent, in contrast, neonatal tetanus seems to completely overshadow the reported incidence of the disease among other age-groups. Tetanus, however, suffers from the same difficulties experienced by many developing countries in assessing and reporting other diseases. The degree of under-reporting is variable from disease to disease, but is obviously high when 60 to 80 percent of the population have no access to health services and, therefore, to contact with someone who could diagnose and report the disease. For tetanus of the newborn, and additional factor, well known by health workers in rural areas of the developing world, is the simple acceptance of neonatal tetanus as one of the "natural" hazards of childbearing. In certain social and cultural groups, a child which does not survive the first 2 or 4 weeks is simply and quietly put aside. Those who make the effort to question villagers quickly find out that the number of newborns who, uncounted, have (by their histories) probably fallen victim to tetanus neonatorum, is so high as to defy the imagination of anyone trying to estimate its incidence. Clear epidemiological information on the incidence of neonatal tetanus as well as that of other children and adults is necessary to adequately plan and evaluate the contribution of primary health care and maternal and child health programmes to preventing and controlling this disease.



WHO Photo by Dr F. Perabo

Neonatal tetanus.

Prevention and treatment

Vaccination

The major preventive strategy for all age-groups is vaccination. Prolonged active immunity is induced by tetanus toxoid, particularly the one adsorbed (held to the surface) on alum. Recovery from tetanus does not assure lasting protection against tetanus. Tetanus vaccination for any person over one year old consists of 3 doses. The first and second are given at least 4 weeks apart. (The second dose can be given as late as 3 months after the first.) The third dose is given about one year later. From then on, boosters should be given every 10 years to those in very high-risk groups and, for others, at the time of an injury or during the second and third trimesters of pregnancy.

When a person who has had no previous tetanus vaccination is severely wounded, they should be started on a full course of tetanus vaccination immediately and take antibiotics (either orally or applied on the wound) within 24 hours. A person who had his/her last tetanus dose more than 5 years previously should likewise receive a booster and at least local antibiotics within the first 24 hours after receiving the injury. In cases where the last tetanus dose was received less than 5 years previously, only cleansing and local antibiotics are required.

The tetanus vaccine is one of the hardy ones. Cold storage (not freezing) is recommended but not essential. Fresh vaccine or vaccine that was in cold chain is stable for 2 to 6 months at 37°C. At 45°C, there is no loss of potency dur-

ing the first 2 weeks' storage, and a marked loss only after 8 weeks. At temperatures above 50°C, however, the vaccine loses its potency very rapidly.[2]

Because of local and regional variations in exposure to risk of tetanus, the choice of groups to be vaccinated, the timing of the doses and boosters should, naturally, take into account the epidemiology of tetanus in the region. Other factors to be taken into consideration would be the financial, personnel and transport resources available. The timing of vaccinations is not bound to strict age schedules. Therefore, where there are few or no village-based health services, a mobile approach to tetanus vaccination is possible, particularly if interested lay-people or clergy can help with the health education that should precede any vaccination drive. Tetanus vaccination and all boosters need to be clearly documented for each individual on a vaccination card. This is the only way to avoid wastage and adverse reactions caused by too frequent boosters and, at the same time, unnecessary use of anti-tetanus serum.

Care of the wound and prevention of infection

Since tetanus spores are present in dust as well as in dried human or animal faeces, any dirty wound is likely to be contaminated. Open and deeply penetrating wounds, those which contain residual foreign bodies or material and those with extensive dead tissue are likely to create anaerobic (lacking oxygen) conditions in which tetanus bacilli thrive. Penicillin and chloromycetine are both active against tetanus bacilli but cannot reach them if the tissue around the wound is dead or has formed much pus. Wounds should, therefore, be very carefully cleaned, washed with soap, foreign material removed, and dead tissue or tissue likely to die cut away. Where available, penicillin powder or chloromycetine can be sprayed in the wound. While the former can also be given orally or by injection, this is not the case with chloromycetine which should be restricted to local application on the wound. Fishermen on the Pahou lagoon in the Republic of Benin learned by trial and error to treat their foot wounds: they put the contents of a chloromycetine capsule on and in the wound.[3] This is an illustration of the kind of self care that can be encouraged where other sources of treatment are difficult to reach.

Use of anti-tetanic serum

The experience of the last 20 years around the world is that, where vaccination is practised, serum can be reserved for the rare case where a severely wounded person was not seen in the first 24 hours after being injured and has had no previous tetanus vaccine. All forms of anti-tetanic serum are very expensive and several can cause a number of adverse reactions and side-effects. Most important, they give only an extremely short-lived passive immunity. To use serum without immediately starting a course of vaccination leaves the person without long-term immunity or protection. Thus, in developing countries, anti-tetanic serum should be administered only if the person has been severely wounded, has not been seen in the first 24 hours after being injured, and has not had previous tetanus vaccine. Even in such cases, where resources are short and anti-tetanic serum not available, thorough cleansing, vaccination and antibiotic treatment are the essential elements of treatment. When anti-tetanic serum *is* given, however, the adult dose is 500 units of Tetanus Immoglobulin (TIG) or, if this is unavailable, 3000 units of equine, or 10,000 units of bovine anti-tetanic serum.

Where resources are plentiful, health workers may, however, wish to follow the advice of the American Public Health Association: "If there has been no previous complete active immunization (at least 3 doses of toxoid) and if the patient is seen on the day of injury and there are no compound fractures, gunshot or other wounds not readily debrided (incised, cut open), passive protection may be induced by injecting 250 units of TIG... If delay is greater, or such complications exist, the dose of TIG... should be at least doubled. TIG is preferred because of the absence of serum reactions and protection provided by TIG lasts about 21 days while that from animal tetanus antitoxin only 3 to 14 days.* Active immunization should be started by giving the first dose of adsorbed, not fluid, toxoid... at the same time as, but at a different site than, that used for the immune globulin or antitoxin. Antibiotics (penicillin) given for 7 days may kill C. tetani in the wound."[4]

Neonatal tetanus

Vaccination of the mother and hygienic delivery practices have been the two main

* while the tetanus incubation period is 4-21 days (average 10 days). (Our footnote.)

strategies for preventing neonatal tetanus. *The Lancet* recently reviewed the experiences in preventing neonatal tetanus through vaccination of the mother since 1961:

"Neonatal tetanus, a preventable infection, still kills many babies in developing countries. Accurate assessment of its incidence can be difficult because in traditional societies death in early infancy tends to go unrecorded. Haiti has a very high death rate from neonatal tetanus –145 per 1000 live births. Probably more representative are the death rates of 61 and 25 per 1000 live births recorded in Papua New Guinea and Bangladesh. In many countries neonatal tetanus still accounts for a quarter to half of all neonatal deaths...

Immunisation of mothers with tetanus toxoid, providing passive protection to the infants by antibody passed across the placenta, is an alternative approach which is especially applicable to communities where deliveries commonly take place in unhygienic surroundings. Controlled trials show that maternal immunisation can be highly effective. In Papua New Guinea there were no cases of neonatal tetanus among the infants of mothers given three doses of formalinised tetanus toxoid, whereas the condition developed in 9% of control infants. Similarly, in Colombia, infants of mothers given two or three doses of alum-precipitated tetanus toxoid up to 4 years previously were completely protected. Two immunisation strategies have been tried. In Papua New Guinea immunisation was done during pregnancy. For this strategy to be successful at the community level, a high proportion of pregnant women must attend an antenatal clinic equipped to undertake vaccination on at least two occasions during pregnancy. Unfortunately, in many developing countries antenatal clinics are sparsely distributed and poorly staffed. Mass immunisation of all women of childbearing age may therefore be a more rational strategy, and this was the approach adopted in Colombia.

WHO Photo by P. Harrison

A village health worker administers a tetanus shot.

In the Matlab field area of the International Centre for Diarrhoeal Disease Research, Bangladesh, both immunisation strategies have been tried. In 1974, in the course of a controlled trial of cholera vaccine, a large number of women in the study were given two doses of alum-precipitated tetanus and diphtheria toxoids. In June, 1978, routine immunisation began with two doses of tetanus toxoid in pregnancy. Analysis of the death rate among infants born between September, 1978, and June, 1979, showed that both immunisation strategies had been effective. The death rate per 1000 live births among infants aged 4-14 days (the period during which most babies die from neonatal tetanus) was 11 for infants of mothers who had received two doses of vaccine during pregnancy, 16 for infants of mothers who had received two doses of vaccine 4 or 5 years previously during the mass vaccination campaign, and 35 for infants of mothers who had not been immunised. The overall effect of immunisation with tetanus toxoid on neonatal mortality was not as great as might have been expected because acceptance rates for vaccination were poor. Only one-third of the women received two doses of vaccine during pregnancy and just over half were fully immunised during the mass vaccination campaign. Objections from the husband or mother-in-law and fears by the mother that vaccination during pregnancy might harm her baby were the main reasons for non-acceptance of immunisation. Thus, health education must be an integral part of any campaign to prevent neonatal tetanus by maternal immunisation.

What general recommendations can be made, on the basis of the studies done so far, for the

prevention of neonatal tetanus by maternal immunisation? Clinical and serological investigations show clearly that two doses of alum-precipitated tetanus toxoid, given either during pregnancy or up to 4 years previously, protect strongly against neonatal tetanus whereas one dose of vaccine is not effective.* Thus, where neonatal tetanus is endemic all women should be given two doses of alum-precipitated tetanus toxoid during their first pregnancy. How often booster immunisation is required is uncertain. Immunisation with tetanus toxoid gives long-lasting immunity but, in normal circumstances, this may depend partly on the presence of primed lymphocytes. However, a mother can protect her infant only if she has a high level of circulating antibody. Booster immunisation every 5 years is likely to maintain a protective antibody level but this may be difficult to monitor. In communities where attendance at antenatal clinics is haphazard, booster immunisation during each pregnancy is an approach that is administratively attractive. It may result in hyperimmunisation of some women, but there is sound evidence that immunisation with tetanus toxoid during pregnancy is safe. In areas where neonatal tetanus is highly prevalent and where antenatal facilities are limited, immunisation during pregnancy should be supplemented by mass vaccination campaigns aimed at all women of childbearing age. Such campaigns should be repeated at regular intervals, perhaps once every 5 years, until satisfactory antenatal coverage can be achieved. In many developing countries infant immunisation programmes are making good progress and the next decade will see an increasing number of girls reaching childbearing age who have received immunisation with triple vaccine during infancy. Studies will be needed to determine what form of booster immunisation these women will need to ensure protection of their infants from neonatal tetanus throughout their reproductive life..."[6]

The spectacular progress made in developing the vaccination strategy against neonatal tetanus was preceded, between 1920 to 1960, by concerted efforts to overcome it either by outlawing traditional birth attendants (TBAs) or even home deliveries and institutionalizing antenatal care and deliveries (but often forgetting post-partum check-ups for mothers and babies), or by training TBAs (who still conduct about 80 percent of all deliveries in most developing countries) to maintain strict hygiene of the umbilical cord during and after cutting it.

The first of these strategies—that of total institutionalization of deliveries—has virtually eliminated neonatal tetanus in industrialized countries and in a very few urban areas of developing countries. It is, however, a very expensive approach which is difficult if not impossible to implement in rural areas of the Third World. Moreover, because of poor maintenance of health facility buildings and breakdowns in supplies of water, soap and antispetics, hygienic conditions in developing-country hospitals and clinics are not rarely unsatisfactory. Attempts to adapt the institutional approach to rural conditions by building smaller maternities run into the problem of numbers. In most developing countries, the village population rarely exceeds 2000 people and the maternity can thus expect no more than some 100 births a year (or approximately 2 per week). It is difficult to maintain even a small building for so little use. So, again, the women end up with the same or less hygiene and certainly less comfort than they would get at home. Moreover, the success of home deliveries in Holland (until about 1960, over 80 percent of all births took place in the home), where maternal and neonatal mortality rates were amongst the lowest in the world, shows that advanced national development does not necessarily mean institutionalization of care during delivery.

The second strategy—that of teaching hygienic practices to TBAs—was first used in Sudan in the '20s[7] and, since then has been alternately neglected and strongly favoured. Early victories in Sudan in reducing the number of neonatal tetanus cases by training TBAs were not followed, in the next two decades, by any documented successes in other countries. Since this approach was sufficiently in contradiction with the major push for professionalization being made at that time, it did not survive even in Sudan itself.

During the late '40s and '50s, the World Health Organization encouraged a revival of interest in TBAs and their training. This was based on evidence that teaching TBAs simple hygiene

* In the period up to 20 months following a campaign of mass immunization of non-pregnant women in rural Bangladesh, the reduction in deaths among 4-14-day-old infants after a single dose of tetanus-diphtheria toxoids was about the same as that after two doses. However, beyond 20 months, a single dose did not appear to provide protection. (Our footnote.) [5]

and providing them with a sterile cutting instrument and a simple ointment to dress the umbilicus (in place of soil, clay, herbs, honey, animal excreta, etc.) can significantly reduce neonatal tetanus, even if the delivery takes place at home in a room crowded with relatives and animals. In addition, such training can help the TBAs improve ante- and post-natal care and ensure coverage of all pregnant women with tetanus toxoid in their second or third trimester.

More recently still, experiences such as that of the Integrated Health Services Programme at Miraj in India, and of a number of other small primary health care programmes have confirmed that TBA training can lead to a significant reduction of neonatal mortality. At Miraj, "While not trying to change too much too soon in the actual practices of the TBAs ("Dais", in the terminology of that region), emphasis of the training is on simple but scientific techniques of conducting home deliveries with the elements of good antenatal, intranatal and postnatal care, basic cleanliness and hygiene. Dais are taught to recognize danger signals in pregnancy and labour so that they are able to refer cases or call in help at a sufficiently early stage. They are also taught to motivate their patients to use one of various methods of family planning as well as to contact defaulters. The simplest kind of health teaching is employed, making use of flash cards and flannelgraphs.

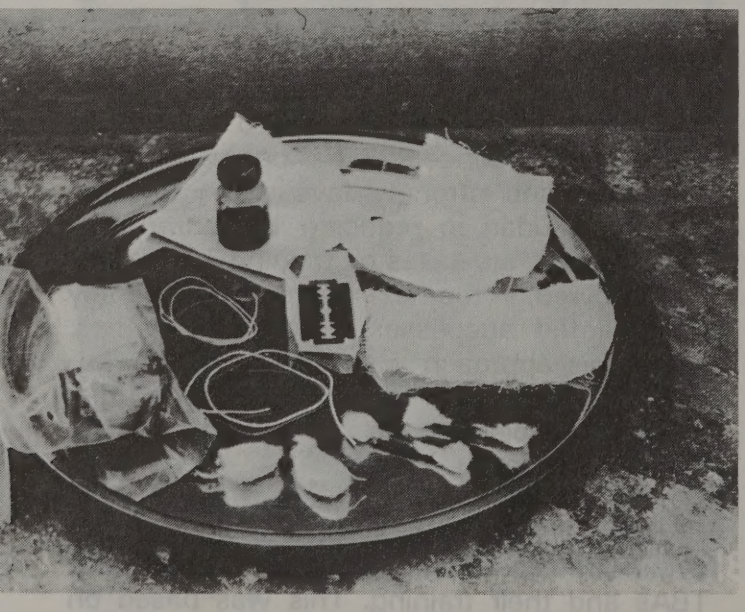
"The training is conducted by the public health nurse, nurse-midwife and auxiliary nurse-midwife of a sector at sector headquarters. Initial training is for 7 days with a further day of training after 15 days. This is followed by a day each month in subsequent months.

"Each Dai is provided with autoclaved delivery packs. She uses 1 delivery pack for each delivery. The pack contains a razor blade, 2 pieces of 9 inch long thread, 2% iodine solution in a used penicillin bottle, 2 cotton balls and 2 Q-tips and a piece of cotton cloth. The cost of such a delivery pack is 50 n.p. (US$ 0.05).

"Dais have no fixed wages and are paid an honorarium of Rs 3 per delivery by the project. The auxiliary nurse-midwives register all pregnant women and provide antenatal care, but for home deliveries, either an auxiliary nurse-midwife or a Dai may be called. The Dai conducting a delivery utilizes her delivery pack and has the details written in her notebook by someone like a school boy. She immediately informs the auxiliary nurse-midwife of her section, who verifies the case, puts her initials on the Dai's notebook and provides postnatal care along with the Dai. Dais refer difficult and abnormal cases to the nurses and doctors and, if necessary, to primary health centres and hospitals for hospital delivery."[8]

The decline in infant mortality rates from 42.1 per 1000 live births in 1974 when the Integrated Health Services Programme and the training of Dais was initiated to 21.2 per 1000 in 1977 is an indication of the success of this approach in reducing neonatal deaths due to a number of causes which include tetanus.[9] This experience has been reinforced by now in Africa, Asia, Latin America, the Caribbean and the Pacific in numerous programmes run by churches and other non-governmental organizations as well as by governments.

The strategy of retraining TBAs will be important for many years to come. It builds on the skills which they already have and which cannot be ignored or dismissed. It recognizes that, for decades to come, they will continue to provide the greater part of maternal and delivery care in developing countries. It further recognizes that institionalized maternity services should not and are in any case unable to displace TBAs from their part in carrying the responsibility for routine antenatal observation (including referral for immunization and where there is risk of complications) and for uncomplicated deliveries.



TBA delivery pack contents. (Miraj, India.)

UNICEF/WHO Photo by J. Ling

The importance of clean water and sterilized equipment. (TBA training in Senegal).

WHO/UNICEF Photo by M. Black

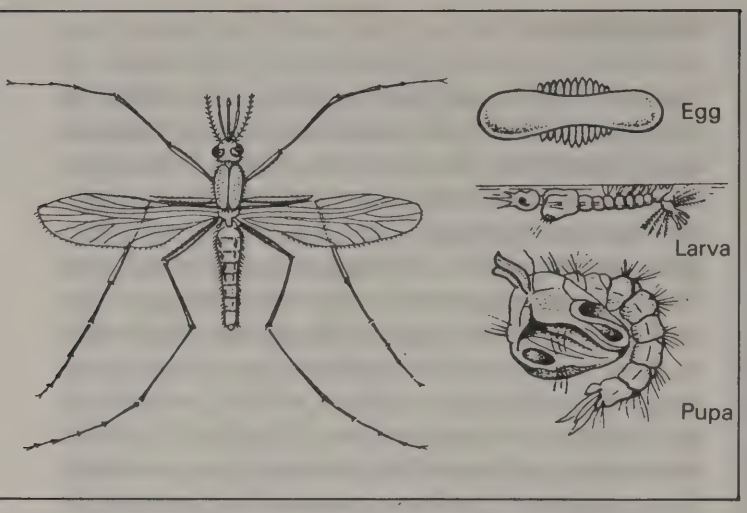
TBA with her UNICEF delivery kit. (West Sumatra).

MALARIA

Malaria has been with us for thousands of years and, from all indications, threatens to stay around for a long time to come. It has proven to be a very hardy and adaptable parasite for humans, which lives out its life in close association with a hardy pest, the mosquito. The malaria organism lives a very complex life cycle, going through one maturation within the body of the female Anopheles mosquito. A second maturation takes place within the body of an infected human, in two phases. The first phase is outside the bloodstream in a so-called "tissue phase", where maturation occurs in cells of the liver, and the second takes place in the red blood cells. The clinical disease results when red blood cells, packed with multiplied malarial cells, burst open and release those forms free into the bloodstream along with their metabolic by-products. It is at this end of the cycle that the mosquito can be infected.

With so many points in the life cycle of malaria, interruption at one or several would seem feasible. However, this has proven to be exceedingly difficult.

In areas where malaria is endemic, indigenous people who have lived there from infancy are able to develop a partial immunity to the local varieties of the Anopheles mosquito and the malaria parasites. This amount of protective immunity requires, it seems, repeated infections over several years. When immunity begins to develop, the human can tolerate malaria parasites in the blood without becoming clinically ill. As immunity becomes more firmly established, the number of parasites detectable in circulating blood decreases. Children under the age of 5 will not, as a rule, have enough immunity to protect them against clinical infection. The greatest toll of morbidity and mortality is found in this age-group. In hyperendemic areas, children over the age of 5 and adults will demonstrate clinical disease relatively seldom. Pregnant women, especially late in their pregnancy, have a tendency to become susceptible to clinical attacks to a variable degree and, like children under 5, are a population at special risk. Where malaria occurs only at certain seasons or in certain years, however, almost the entire population, regardless of age, is likely to suffer clinical attacks of malaria, since exposure will not have been intense enough in their early years to allow the development of this partial immunity.



Egg, Larva, Pupa and Adult form of the female Anopheles mosquito.

Malaria is found wherever the Anopheles mosquito vector is present and where the mean monthly temperature is above 15.6°C—the minimum required for parasite development. In such regions, however, the presence and rates of malaria vary from one place to another. These natural variations have been modified as a result of malaria control programmes. In some areas, for instance, malaria parasites have been eliminated but the Anopheles mosquitos remain.

There are four known strains of malaria which are of clinical importance to humans: *Plasmodium falciparum* (which results in the greatest number of deaths since it is responsible for most cases of cerebral malaria, severe anaemia and haemolytic crises), *P. malariae, P. ovale* and *P. vivax.* All four strains are not equally prevalent in any given region or country. *P. falciparum* is the dominant organism in most of Africa while *P. vivax* is the most important in parts of Asia, for example.

Epidemiology

In 1978, the World Health Organization noted that "During the past 10 years, the malaria situation has progressively deteriorated in several countries. The resurgence of the disease has particularly affected countries in southern Asia, some countries in Latin America and Turkey, sometimes reaching epidemic proportions. According to the information available, in the last five years, there has been on average, taken globally, more than a two-fold increase in the number of cases reported. In some countries the increase has reached dramatic proportions, with the figures showing a thirty- to forty-fold increase compared with 1969-70".[10]

In 1980, more than 8.2 million malaria cases were reported to WHO, compared to 3.25 million in 1972. Data from Africa south of the Sahara, where an average of 5.5 million cases have been reported annually in recent years, are **not** included in this global figure. In El Salvador, Guatemala, Honduras and Nicaragua, in spite of anti-malaria programmes, the situation has deteriorated since 1975. The total number of cases in these countries increased from 188,000 in 1979, to 227,000 in 1980. In China, malaria incidence increased from 2.3 million in 1979 to 3.3 million in 1980. WHO recognizes that even these global figures are underestimates since not all malaria cases are reported.[11] At least one million African children under the age of 14 die every year from malaria, and the number increases annually.[12]

As its overall objective, the worldwide drive against malaria has swung from control to eradication and back to control in 20 years. Control of malaria is understood as a reduction of the transmission and number of cases of the disease to levels that are not considered a major public health problem and are tolerated by the community. These levels need to be defined locally. Eradication, on the other hand, is the interruption of transmission and complete elimination of the clinical disease. The global malaria programme has moved from "the high hopes of the 1950s, when the policy of worldwide malaria eradication was adopted by the WHO, to the disillusionment of the 1970s,

WHO photo

A malaria victim.

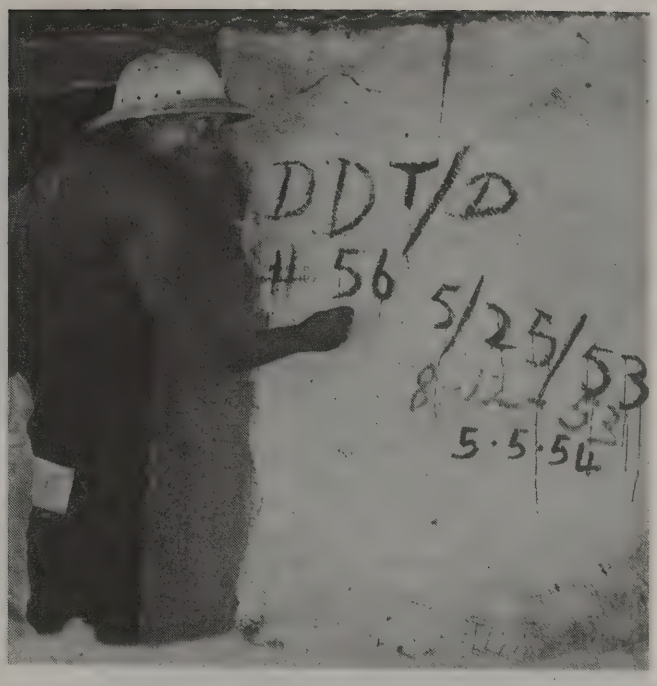
when it (was) acknowledged that the initial impetus and success could not be maintained. Now, with malaria rampant in many areas of the world where it had formerly been kept well under control, health authorities are being forced to reconsider their policies and priorities. Malaria is not only a disease with a past; it is one with a future."[13]

One set of reasons for the resurgence of malaria are factors like increased cost of materials and equipment; lack of adequate administrative and general services and structures to support anti-malaria activities; shortage of trained personnel and difficulties in attracting and keeping experienced personnel; and limits to the involvement of rural health services in anti-malaria activities. Another reason is uncontrolled development of irrigation, deforestation and human settlement in malarious areas, resulting in increased breeding of the vector.

Two of the most critical causes of malaria resurgence are, firstly, the Anopheles mosquito's growing resistance to the insecticides used to control it and, secondly, the development of resistance in malaria parasites, particularly *P. falciparum,* to drugs used in malaria treatment and prevention.

Insecticide resistance

Optimism in the late 1950s that malaria could be eradicated was mostly based on evidence of the effectiveness of new, long-lasting, relatively low-cost insecticides such as DDT and dieldrin (organochlorides). The extensive use of these insecticides in ever-increasing quantities and strength by mosquito control programmes, large-scale farming enterprises as well as by small farmers and home-owners undoubtedly hastened the development of vector resistance. Since 1975, this resistance has continued to spread and to affect malaria control programmes in many countries. The most significant development has been the appearance of multi-resistance. Altogether, 51 species of Anopheline mosquito have been reported to be resistant to one or more insecticides: 34 are resistant to DDT, 47 to dieldrin and 30 to both. Resistance to another, more expensive group of insecticides, the organophosphates, has been recorded in 10 species, and resistance to a third class, the carbamates, in 4 species.[14]



WHO photo

Date of the spraying is recorded. (Liberia)

"The seriousness of the technical and financial problems faced in some malaria control programmes, due in part to the emergence or further spread of organophosphate resistance... cannot be over-emphasized. The long-lasting and relatively low-cost organochlorides formerly used in malaria control have had to yield in some areas to the organophosphate and carbamate compounds, which not only are more expensive to manufacture, but also require more frequent application. Thus, expenditure on vector control has greatly increased and... in many developing countries is reaching or exceeding the levels acceptable to governments."[14]

Drug resistance

For a long time, the most commonly used, effective and least expensive anti-malaria drugs have been the 4 aminoquinilines. This group includes 2 generic presentations, chloroquine and amodiaquine. (Chloroquine is perhaps better known to many by its trade names which include Nivaquine, Aralen, Resochin and Avochlor; amodiaquine is sold under the trade name of Camoquine.) Chloroquine resistance, detected and confirmed in South America and Asia some 20 years ago, has become a very serious problem on those continents and now touches Africa as well. It has been reported that over 90 percent of cases in some parts of Southeast Asia are now resistant to chloro-

quine. In Thailand, a stronghold of malaria, chloroquine now fails to completely cure malaria in 90 percent of all *falciparum* cases and does not give any clinical benefit at all to a growing number of cases. In India, it was believed until recently that chloroquine-resistant *falciparum* malaria was restricted to the Northeast. It has now been proved that the problem is more widespread. In Africa, chloroquine resistance was reported in 6 countries in 1982, while in South America, chloroquine resistance exists in nearly all areas where *P. falciparum* is found.[15]

Table 1

Countries where resistance to chloroquine has been reported
(Source: World Health Organization)

Asia:	Bangladesh, Burma, China, India, Indonesia, Kampuchea, Laos, Malaysia, Nepal, Philippines, Thailand, Vietnam.
Americas*:	Bolivia, Brazil, Colombia, Ecuador, French Guiana, Guyana, Panama, Peru, Surinam, Venezuela.
Pacific:	Papua New Guinea, Solomon Islands, Vanuatu.
Africa:	Comoros, Kenya, Madagascar, Tanzania, Uganda, Zambia. (Reported, but *not* confirmed in Burundi, Ethiopia, Ivory Coast, Nigeria, Rwanda, Somalia, Sudan.)

* Resistant strains are not know to exist in Central America, Mexico and the Caribbean.

Chloroquine remains the most important drug for both the prophylaxis and treatment of malaria the world over. However, it cannot be depended upon exclusively for two reasons. The first is the problem of resistance referred to above. The second is that it cannot effect a radical cure of certain types of malaria (most notably, *P. vivax* malaria) where the parasite can hide for a prolonged period in the liver in a form which is not susceptible to chloroquine. **Quinine** has been a very important drug in malaria treatment in the past. It has greater toxicity than chloroquine but remains an important alternative in resistant cases. **Pyrimethamine** (trade name: Daraprim) has been used extensively for prophylaxis. However, it is now discouraged because of growing resistance and evidence of a perhaps even greater tendency to resistance development than other drugs. **Proguanil** (trade name: Paludrine) is a drug still in widespread use for prophylaxis. **Primaquine** is another important anti-malarial drug and is the one now used (generally in combination with chloroquine) for the radical cure of *P. vivax* cases to eliminate the liver parasites, as well as in some *falciparum* cases (see below). **Tetracycline** is also of limited use in malaria treatment. It slowly eliminates the parasites from the bloodstream and thus requires rather lengthy administration. Its toxicity and side-effects must be kept in mind and preclude its use with children or pregnant women. Finally, it has long been known that drugs of the sulfanilamide group have some effectiveness against malaria. The one useful presentation in this group is **sulfortomidime** (perhaps more commonly referred to by its other generic name, **sulfadoxine**) and goes under the trade name of Fanasulf or Fanasil. It is most commonly used in combination with pyrimethamine, in which case it carries the trade name Fansidar. This is the most suitable drug for the treatment of *falciparum* malaria resistant to chloroquine and, when used in the combination presentation with pyrimethamine, is the prophylactic agent recommended for those travelling in areas where chloroquine resistance is known to be strong.

Of all the drugs enumerated above, the least expensive and most widely available are chloroquine and amodiaquine. Health workers depend heavily on these two drugs and populations in general know most about, and can afford to buy them. The other drugs cost substantially more and this is particularly true for the sulfadoxine/pyrimethamine combination. For populations living in endemic and hyperendemic areas, there is a tendency to self-treatment with chloroquine or another drug at the slightest indication of fever. The dosages employed, however, are often inadequate to actually effect a full cure, if the case really is due to malaria. Such unnecessary, irregular or inadequate use of anti-malarial drugs contributes to the development of drug resistance in malaria strains. A major challenge remains for national health planners to address the question of the proper use of drugs, their place in an adequately conceived malaria control programme and the public education (including all levels of health workers) required to make such a programme fully effective.

Effects on health and development

Like many other tropical diseases, malaria interacts with other diseases and with malnutri-

tion. Someone suffering from malaria is much more susceptible to other infections and vice versa. With each malaria attack, a person loses the equivalent of about 3 days of food for an adult. The effect of this kind of interaction between malaria and nutrition is particularly dangerous for malnourished groups with few reserves and low resistance, such as babies, small children and pregnant women. The increased susceptibility which is the result of such interaction makes malaria control, and the control or prevention of other tropical diseases, more difficult and increases the burden on already small and overburdened health budgets.

The implications for socioeconomic development are enormous. Where malaria is endemic and interacts with other diseases to weaken a large section of a country's workforce, production suffers accordingly. "In many countries, malaria is an important cause of continuing poverty. Successful anti-malaria schemes have often been followed by a marked improvement in the social and economic conditions of the country."[16]

In many parts of the world, there are seasonal fluctuations in the incidence of malaria due to variations in temperature, humidity and rainfall on the one hand, and the habits, life-cycle and density of mosquitos on the other. Often, seasonal outbreaks or epidemics of malaria occur at the same time as the period of greatest agricultural activity (planting to harvest), when most labour is needed. When this happens, not only does malaria cause more deaths (people working hard must draw more heavily on their energy reserves and thus have less resistance to disease), but agricultural production is also penalized.

WHO Photo by J.C. Abcede

A survey team in Papua New Guinea collects blood samples to determine the presence of malaria parasites.

Malaria control

The end objective of the global malaria programme was the eradication of the disease. As we have seen, this is proving very difficult to achieve. A more realistic objective—malaria control—has now been adopted by the WHO. The aim is, firstly, to bring deaths and illness due to malaria down to very low levels and, secondly, to reduce the presence of malaria in the community to a level where it does not adversely affect socioeconomic development. For health services and workers in malarious areas, this means working to both treat and prevent the disease. The principal ways to prevent malaria are to control the vector, and use of drugs to control the parasite (chemoprophylaxis).

The efforts of individual community health workers to prevent and treat malaria will be successful only if they fit into and are supported by the national malaria control programme which, in turn, fits into the national health plan. Planning and coordination at a national level is essential to mobilize the financial, technical and personnel resources needed to carry out surveys and vector control activities and the distribution of drugs and insecticides. The gathering of information—on the epidemiology of malaria in the country by region and locality; on the levels and location of resistance to/effectiveness of different drugs and insecticides; on meteorological data; on environmental factors (e.g., details of permanent and temporary surface waters, local domestic, agricultural and industrial uses of water); on people's mode of life (e.g., housing, sleeping habits, etc.); on the presence of adult

mosquitos and larvae, their breeding places, flight range, etc.—is a particularly vital government responsibility. This knowledge must be available to community health workers to help them chose the curative and preventive measures which will work best in their area.

Primary health care programmes with active community participation provide vital support to the national malaria control programme. For the various measures to succeed, it is essential that all cooperate, and it is, after all, at the community level where most of the critical measures must be carried out.

Prevention

1. **Vector control:**
   Part of a malaria control programme is the direct attack on the mosquito itself and on its contact with humans. Such a vector control programme begins with efforts included in the government programme and carried out by specified workers, but community involvement is essential to make the programme complete and effective. This is where every health worker can contribute by informing and motivating villagers to take their part in the various activities.

Several methods of vector control can be used. The aim of one group of methods is to kill the mosquito **larvae**. Mosquitos breed in standing water, including marshes (swamps), pools of standing water, open tins and bottles in garbage dumps and the like. Communities can be mobilized to assure that there is no such unused water near human dwellings by destroying or burying garbage, filling in pools or marshes with soil, or pouring oil (petroleum or kerosene) on the surface of stagnant water. The national programme may well include treatment of bodies of standing water which are too large for the community to deal with.

The second group of vector control measures is directed at the **adult mosquito**. One important step here is to kill the mosquitos by spraying houses with residual insecticide. This type of insecticide remains toxic on walls and other surfaces for weeks or even months after its application. Insects coming in contact with it rapidly die. This is the type of product that is generally employed in major campaigns to control the mosquito vector. Products which can be purchased by individual families are frequently much less effective or of much

WHO photo by Pierre Pittet

Checking temperature and humidity and collecting mosquitos for analysis, Upper Volta.

shorter duration than those used by large-scale spraying techniques. Hidden and sheltered surfaces must not be neglected because, during the daytime, adult mosquitos generally disappear and rest behind cupboards, under tables and beds and so on.

An additional group of measures serve to minimize the possibilities of being bitten by the adult mosquito. Included among these **protective measures** is wearing long trousers and sleeves and, during the most intense mosquito seasons, such as the later parts of the rainy season, using insect repellant on the skin. Sleeping under mosquito nets (which should be arranged over the bed before dusk) is another effective means, improved if houses themselves are screened. It is also very helpful to make sure that long grass, bushes and undergrowth are cleared away from around houses and for a distance of 10 meters or more. This takes into account the adult mosquito's habit of sheltering in shady places during the daytime, and the fact that mosquitos generally do not fly far from their resting place.

Environmental measures such as those described above were neglected for a long time after the introduction of residual insecticides. Because of the widespread development of resistance to these insecticides, however, these measures are attracting a great deal of interest and their use again being promoted.

2. Chemoprophylaxis

The chemoprophylaxis of malaria refers to the taking of anti-malarial drugs to avoid or prevent the development of the parasite within the body or to suppress the emergence of a clinical epidsode of malaria. Work continues on a malaria vaccine, but it appears that the breakthroughs required to make this widely available are still a considerable way off. The approach to chemoprophylaxis has evolved very steadily over the last 20 years as our understanding of the action of various drugs has grown and we have come to appreciate the increasing seriousness of the problem of drug resistance.

Chemoprophylaxis needs to be looked at in two ways, depending on whether we are dealing with populations indigenous to malaria zones or travellers or short-term residents in such zones who themselves come from non-malarious areas. For the **indigenous population of a malaria zone**, chemoprophylaxis should be used only in very limited circumstances to enable their extremely valuable semi-immunity to develop and be maintained. This usually develops in the age period from 4 to 6 months (before which time some maternally transmitted passive immunity offers protection to the infant) up to 5 years of age when serious clinical attacks taper off. It requires a number of febrile malaria attack episodes; with each subsequent attack over the years, the semi-immunity is reinforced. Sustained prevention during those important years is, therefore, unwise since it will prevent the development of natural protection. An approach to protecting children called semi-suppression has attracted some interest. The idea here is that suppressive doses of anti-malarials are given at more widely-spaced intervals than those required for full protection in order to allow the malaria organism to develop in the body and the immune response to take place. Most authorities now agree, however, that this is not advisable. It encourages the selection of strains which are resistant to the drug being given in inadequate dosages. If applied widely, this practice could, in fact, have long-term ill-effects for the community. The alternative is to allow infections to occur while assuring that everything possible is done to provide prompt treatment for each attack, or presumed attack.

The only strong indication for the suppressive use of anti-malarials in semi-immune people seems to be for women during pregnancy. In this case, it is best to begin with a curative dose to eliminate the organisms from the body at the outset of prophylaxis. Children at special risk as a result of an unrelated illness should receive a full curative course of anti-malarial drugs on a presumptive basis rather than regular suppressive dosages.

Chemoprophylaxis is, therefore, most important for **travellers and short-term residents in malarial zones.** Present recommendations now indicate the use of three different programmes:

a. Proguanil
This continues to be recommended by many authorities since, in some ways, it is the ideal prophylactic agent. It attacks the malaria organism in the earliest hours of its entry into the body and at the outset of its lifecycle in the human. The course should be started one week before arrival in a malaria zone and continued for 4 to 6 weeks after departure. The dosage for adults is 1 or 2 tablets of the 100 mg size, taken **daily.** The higher dose should be reserved for areas, or times of the year, when mosquito exposure is heavy. This dosage is suitable for children from 13 years and up. Children 6 to 12 years should take 1/2 tablet daily; children under 6 years may take a 1/4 tablet (or one 25 mg tablet) daily. There is little evidence to contra-indicate proguanil for pregnant women, but our recommendation is that pregnant women depend on the chloroquine regimen proposed below. Proguanil is not useful in the treatment of clinical attacks of malaria.

b. Chloroquine
This is the standard prophylactic agent and is the one most highly recommended for most areas. In spite of confirmed reports of *falciparum* strains resistant to chloroquine in Africa, this is the recommended prophylactic drug for travellers to all parts of that continent. Now, more strongly than ever, it is stressed that the dosage be adequate to provide as much prophylactic protection as possible. The recommended dose is, therefore, 5 mg per kilogram of chloroquine base, on a weekly basis. It bears emphasizing that weekly administration should be on the same day of the week and without fail. For a 60-kilogram adult, this means 2 tablets taken together to reach the 300 mg recommended weekly dose. Adults well in excess of 60 kilograms should increase the dosage correspondingly. The correct dose for children can also be calculated on the 5 mg per kilogram basis, but a rule of thumb is 1/4 tablet for children of 6 months to 1 year, 1/2 tablet for ages 1 and 2, 3/4 tablet for ages 3 to 6, one tablet for ages 7 to 11, 1 1/2 tablet for ages 12 to 14, and 2 tablets for 15 years or more. This is the absolute minimum weekly dose now recommended. Where the risk of contracting malaria is exceedingly high, or in areas where *P. falciparum* is hyperendemic, the dosage may be doubled. Chloroquine is completely safe for pregnant women; this is the regimen of choice for them.

Amodiaquine is a close analogue of cloroquine and the dosages recommended are basically the same. It should be noted that the most common preparation available is a tablet of 200 mg of amodiaquine base. This is somewhat higher than the chloroquine dose per tablet, but the same dosage, tablet for tablet, is generally recommended.

c. Sulfadoxine and pyrimethamine
This combination, presented in a tablet of 500 mg of the sulfadoxine and 25 mg of pyrimethamine (Fansidar) is the recommended prophylactic for Southeast Asia, the area where chloroquine resistance is most intense (in Thailand, to the 90 percent level). It is not advisable to use this combination on a prolonged basis, however, since certain side-effects become more common after a year or two of use. It is absolutely **contra-indicated** for pregnant women. In Southeast Asia, pregnant women should depend on a somewhat increased level of chloroquine protection, taken faithfully, with medical evaluation recommended at the first indication of fever. The sulfadoxine/pyrimethamine combination is also contra-indicated for infants, although the 7 to 12-year age-group may tolerate 1/2 tablet weekly without difficulty, and the one to 7-year group 1/4 tablet. Under one year of age, chloroquine is problably safer for prophylaxis.

Treatment

While, in the prophylaxis of malaria, a clear distinction is made between indigenous populations and travellers, this is no longer the case for treatment. In the past, it was considered that, for indigenous people, a single small dose of anti-malarial medicine would be sufficient because of the reinforcing effect of their partial immunity. This may still be the case but a risk exists that such an approach will encourage the emergence of resistant mutations of the organism. Thus, full treatment of each clinical attack of malaria has become essential for indigenous people and travellers alike. It may, consequently, be necessary to modify the common practice of administering a "sup-

pressive" dose of anti-malarial to all well children attending a maternal and child health care centre. Particularly where *falciparum* malaria is widespread, it is better to give children in the age of greatest susceptibility to infection (6 months to 3 years of age) one or 2 *full* curative courses of treatment during the latter part of the rainy season. This will allow them infection-free periods during the high-risk seasons and lead to complete cure in each case, rather than simply suppression. It is very important that mothers be educated so that, when access to health services is difficult, they may presumptively treat, to the full treatment course, each attack of fever. Reinfection will, of course, take place and with each attack, the immune system is further stimulated. This is now considered the best way to encourage the maintenance of semi-immunity and provide protection to the population, while discouraging the development of resistance.

1. Standard treatment course with cloroquine or amodiaquine: (See Table 2, below.)

quine or amodiaquine is coupled with primaquine and relies on the same chloroquine dosage schedule as that in the standard treatment, with the simultaneous administration of primaquine. Primaquine should not be given to children of 6 months of age or less, or pregnant women. Radical treatment of proven *falciparum* malaria only requires 3 days of primaquine, while 14 days of primaquine are required for proven infections of *vivax, ovale* and *malariae* malaria. Where radical treatment is desired and the malaria strain has not been unequivocally identified, or where mixed infection can occur, the 14-day course of primaquine should be added to the normal 3-day course of chloroquine or amodiaquine.

The dosage for primaquine is given in Table 3, below, showing the daily dose to be administered over 3 or 14 days, as indicated above. Should relapses occur, the entire radical treatment can be repeated after a few weeks.

Table 2 [17]

Age-group	Chloroquine or amodiaquine (3 days) *					
	1st day		2nd day		3rd day	
	No. of tablets	mg/base	No. of tablets	mg/base	No. of tablets	mg/base
Under 6 months	1/4	37.5	1/4	37.5	1/4	37.5
6-11 months	1/2	75.0	1/2	75.0	1/2	75.0
1-2 years	1	150.0	1/2	75.0	1/2	75.0
3-6 years	1	150.0	1	150.0	1	150.0
7-11 years	2	300.0	1 1/2	225.0	1 1/2	225.0
12-14 years	3	450.0	2	300.0	2	300.0
15 years & over	4	600.0	3	450.0	3	450.0

* tablet with 150 mg/base

2. Radical treatment of infections:
   There has been renewed emphasis on the need for radical treatment of infections in order to assure full elimination of the parasite from the body in the case of travellers who will not again be exposed and in cases of indigenous people at risk for one reason or another. Radical treatment generally involves the addition of primaquine, a drug which treats the parasite in its tissue phase and, therefore, provides a measure of protection against relapse.

   A radical course of treatment with cloro-

Table 3 [17]

Primaquine		
Daily dose		
Age-group	No. of tablets	mg/base
Under 6 months	—	—
6-11 months	1/2	2.5
1-2 years	1/2	2.5
3-6 years	1	5.0
7-11 years	2	10.0
12-14 years	1	15.0
15 years & over	1	15.0

3. Treatment of infections where resistance to chloroquine is known, likely or suspected: Here, reference should be made to the list of countries where chloroquine resistance has been reported and confirmed (see Table 1, page 12). The standard treatment for infections in these cases must call upon alternatives to chloroquine treatment and, in general, should use a drug different than that which is used for prophylaxis for travellers. For African countries and even in those where resistance has been reported, standard treatment with chloroquine is still the first recommendation. If there is no response, and blood smears confirm the persistence of malaria, a standard dose of 3 tablets of the combination drug sulfadoxine 500 mg/pyrimethamine 25 mg should be taken together as a single dose. It should be remembered that the response to this treatment is somewhat slower than that to chloroquine and fever may persist for one or two additional days. Its contraindications for pregnant women should also be recalled.

   For Southeast Asia and countries of Latin America where resistance has been established, the radical treatment of *P. falciparum* infections requires a more energetic approach. One is to use a combination of sulfadoxine/pyrimethamine and primaquine. The schedule for this treatment course is as shown in Table 4, below.

   A final recourse in drug-resistant cases is careful use of quinine by injection and a 14-day course of tetracycline.

4. Treatment of patients with uncontrolled vomiting and coma:
   In the event of malaria coma, 5 mg per kilogram of body weight of chloroquine base, diluted in 250 ml of physiological saline solution, must be given slowly by the intravenous route approximately every 18 hours, until the patient can swallow. Plasma can also be used as the vehicle for chloroquine and facilitates the treatment of shock and anoxaemia. Administration should be at a rate of 30 to 40 drops per minute. Similar doses can be administered by deep intramuscular route if intravenous administration is not possible. With the precomatose or comatose state of cerebral malaria, the addition of 3 to 10 mg of mexamethasone sodium phosphate every 8 hours will help reduce cerebral odema and intramuscular sludging.

   If there is uncontrollable vomiting, without coma, treatment with chloroquine by the intramuscular route can be pursued according to the following schedule: (See Table 5.)

Table 4

Radical treatment of P. falciparum infections resistant to the 4-aminoquinolines[18]

Age-group	Drugs, doses and intervals								
	First day				Second day		First day only		
	Pyrimethamine *		Sulfadoxine **		Sulfadoxine		Primaquine		
	No. of tab.	mg/base	No. of tab.	mg/base	No. of tab.	mg/base	No. of tablets		mg/base
							Ad.	Ch.	
6-11 months	1/2	12.5	1/4	125.0	1/4	125.0	—	—	—
1-2 years	1	25.0	1/2	250.0	1/4	125.0	—	1 1/2	7.5
3-6 years	1 1/2	37.5	3/4	375.0	1/2	250.0	1	2	10.0
7-11 years	2	50.0	1	500.0	1/2	250.0	2	—	15.0
12-14 years	2	50.0	1 1/2	750.0	3/4	375.0	3	—	30.0
15 years or more	2	50.0	2	1.000.0	1	500.0	3	—	45.0

Note: Should relapses occur after this treatment, repeat the same schedule.
For children under 6 months of age, administer 1/4 of a tablet of chloroquine or amodiaquine (37.5 mg/base) daily for 3 days.
Adult: primaquine with 15 mg/base
Child = primaquine with 5 mg/base

* Tablets with 25 mg

** Tablets with 500 mg (Fanasil)

Table 5

Doses of injectable chloroquine by the intravenous or intramuscular route[19]

Age-group	Doses of chloroquine 1 ml=40 mg/base	
	mg/base	ml
6-11 months	40	1
1-2 years	80	2
3-6 years	80	2
7-11 years	160	4
12-14 years	200	5
15 years or more	280	7

Since transient hypotension may occur after paroenteral administration of chloroquine, particularly in anaemic children, the patient should be kept lying flat for two hours after each dose.

If the intravenous and intramuscular routes are not possible for any reason, chloroquine tablets can be dissolved in 200 ml of water or glucose solution, in a dose of 5 mg per kilogram of chloroquine base, and administered every 8 hours as an enema until the oral route can be established. In children up to 6 years of age, a chloroquine solution in the same dose (5 mg per kilogram) in tablets dissolved in 100 ml of water may be used as the treatment dose per rectum.

* * *

The recommendations for prophylaxis and treatment in this article have drawn upon the current recommendations of the Panamerican Health Organization and the World Health Organization, as well as the field experience of CMC staff. Experienced health teams in many places may well continue to pursue other schedules of treatment and the evolution of our knowledge of what is best for malaria will continue. Before the end of 1983, malaria experts from around the world are expected to gather under WHO auspices to look at the question of resistance to anti-malaria drugs and to further refine the recommendations for various regions of the world. New information from that meeting deemed useful for CONTACT readers will be shared with you in a later issue.

Taking a more aggressive approach to malaria in the effort to reverse the deteriorating situation around the world obviously has its resource implications. Many poor communities and health posts with very limited resources will have to struggle and, in many cases, will continue to confine themselves to the use of chloroquine as the mainline drug for malaria. Until newer and more effective drugs become available, therefore, greater resources may need to be devoted to making the necessary drugs available wherever malaria is a problem.

References

1. Avant-Projet de Programme Elargi de Vaccinations pour la République du Mali. Première Phase: Région de Sikasso. Rép. du Mali, Ministère de la Santé Publique et des Affaires Sociales. 1980. (Unpublished report.)
2. WHO: "Heat Stability of Vaccines", *Weekly Epidemiological Record* No. 33, 15 August 1980, Geneva.
3. OYEGBITE, K. & DE SWEEMER, C.: Baseline survey for PAHO Primary Health Care, 1978. (Unpublished.)
4. BENENSON, A. (ed.): *Control of Communicable Diseases in Man,* American Public Health Association, 1981, p. 351.
5. BLACK, R.E., HUMBER, D.H., & CURLIN, G.T.: "Reduction of neonatal tetanus by mass immunization of non-pregnant women: duration of protection provided by one or two doses of aluminium-adsorbed tetanus toxoid", *WHO Bulletin* No. 58 (6), 1980, Geneva, p. 927.
6. "Prevention of Neonatal Tetanus", *The Lancet,* June 4, 1983, London, pp. 1253-4.
7. WILLIAMS, C.D. & JELLIFFE, D.B.: *Mother and child Health. Delivering the Services,* Oxford University Press, p. 148.
8. RAM, E.R.: "Realization of an Integrated Health Services Programme in Rural India", *CONTACT* No. 44, CMC/WCC, 1978, Geneva, p. 3.
9. "The Training of Traditional Birth Attendants (Dais)", Voluntary Health Association of India, 1978, New Delhi. (Unpublished paper.)
10. WHO: "Malaria control—a reoriented strategy", *WHO Chronicle* Vol. 32, No. 6, June 1978, Geneva, p. 226.
11. WHO: "Synopsis of the World Malaria Situation 1980", *Weekly Epidemiological Record,* No. 28, 16 July 1982, Geneva.
12. *Ideas and Action Bulletin* No. 145, 1-2, Annex to special issue on rural health, FAO/Freedom from Hunger Campaign, 1982, p. 10.
13. FARID, M.A.: "The Malaria Programme—from Euphoria to Anarchy", *World Health Forum*, Vol. 1, No. 1, 1980, Geneva, p. 8.
14. WHO: "Resistance of disease vectors to pesticides: present status", *WHO Chronicle,* Vol. 35, No. 4, 1981, Geneva, p. 143.

15. WHO: "Urgent efforts needed to combat drug-resistant malaria", *WHO Chronicle,* Vol. 37, No. 1, 1983, Geneva, p. 11.

16. WHO: Expert Committee on Malaria, Seventeenth Report, *Technical Report Series,* 640, 1979, Geneva, p. 32.

17. LOPEZ-ANTUNANO, F.J.: "Guide to chemotherapy of human malaria", *PAHO Scientific Publication* No. 373, PAHO/WHO Division of Disease Prevention and Control, 1979, p. 11.

18. Ibid., p. 14.

19. Ibid., p. 19.

Additional references

BERGGREN, W.L., EWBANK, D.C., BERGGREN, G.G.: "Reduction of mortality in rural Haiti through a primary-health-care program", *N. Engl. J. Med.,* 304, 1981, 1324-30.

MACLENNAN, R., SCHOFIELD, F.D., PITTMAN, M., HARDEGREE, M.C., BARLIE, M.F.: "Immunization against neonatal tetanus in New Guinea: Antitoxin response of pregnant women to adjuvant and plain toxoids", *WHO Bulletin,* 32, 1965, 683-97.

MILLER, J.K.: "The prevention of neonatal tetanus by maternal immunization", *J. Trop. Pediatr.,* 18, 1972, 160-67.

NEWELL, K.W., LEHMANN, A.D., LEBLANC, D.R., OSORIO, N.G.: "The use of toxoid for the prevention of tetanus neonatorum. Final report of a double-blind controlled field trial", *WHO Bulletin,* 35, 1966, 863-71.

RAHMAN, M., CHEN, L.C., CHAKRABORTY, J., YUNUS, M., CHOWDHURY, A.I., SARDER, A.M., BHARIA, S., CURLIN, G.T.: "Use of tetanus toxoid for the prevention of neonatal tetanus. I. Reduction of neonatal mortality by immunization of non-pregnant and pregnant women in rural Bangladesh", *WHO Bulletin,* 60, 1982, 261-67.

RAHMAN, M., CHEN, L.C., CHAKRABORTY, J., YUNUS, M., FARUQUE, A.S.G., CHOWDHURY, A.I.: "Use of tetanus toxoid for the prevention of neonatal tetanus. 2. Immunization acceptance among pregnant women in rural Bangladesh" *WHO Bulletin,* 60, 1982, 269-77.

SCHOFIELD, J.D., TUCKER, V.M., WESTBROOK, G.R.: "Neonatal tetanus in New Guinea. Effect of active immunisation in pregnancy", *Br. Med J.* ii, 1961, 785-89.

SURI, J.C., DHILLON, H., GREWAL, H.S.: Active immunization of women in pregnancy for prevention of neonatal tetanus", *WHO Bulletin,* 31, 1964, 349-57.

WHO: *Vaccination Certificate Requirements for International Travel and Health Advice to Travellers,* WHO, 1983.

CMC NOTES

The **Ecumenical Institute at Bossey**, just outside Geneva, Switzerland, was created to fulfil the following aims:

- to provide training for future generations of ecumenical leaders, both clergy and lay;
- to promote ecumenical theology within the framework of intercultural and interconfessional encounters;
- to bring together in an ecumenical spirit the universal vocation of the church to unity and mission with the concrete demands of regional and local ecumenism;
- to create a community in which ecumenism is experienced and shared;
- to practise ecumenical education with wider perspectives in a broader context; and
- to share in an ecumenical spirituality which respects the diversity of liturgical traditions.

Under the auspices of the World Council of Churches and the University of Geneva, an annual graduate course is offered at the Institute. A number of short courses are also conducted during the summer months. The 1984 programme of the Institute has just been announced:

33rd Session of the Graduate School of Ecumenical Studies
Theme: *"Faith and Christian Discipleship Today"*
Dates: 15 October 1984–28 February 1985

20-30 March 1984
"Confessing Christ Today–Present ecumenical dimensions of the theological declaration of Barmen 1934"

9-22 April 1984
"Orthodox Theology and Spirituality"

28 May-2June 1984
"The Service of Women in the Church"

28 June-6 July 1984
"Biblical and Theological Perspectives on Power"

20-31 July 1984
"Models for Ministry among the Poor"

For further information on course content, cost of board and lodging, names and addresses of the National Correspondents and possibilities of financial assistance, please write to the Programme Secretariat of the

Ecumenical Institute
Château de Bossey (Vaud)
CH-1298 Céligny
Switzerland

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A **Diploma in Education for Primary Health Care** is offered by the Department of Community Medicine of the Manchester Medical School and the Department of Adult and Higher Education at the University of Manchester. The three course components cover:
- health and the role of health education,
- adult education methods and skills, including an integrated intersectoral approach based on community participation, and
- option al courses on literacy, adult education in developing countries, population, etc.

Topics treated include the need for PHC, role of the village-level worker and of an adequate referral system, PHC in the context of integrated rural and urban development and as part of a world-wide emphasis on people's participation in development.

The Diploma is an advanced award open to graduates, and to non-graduates who have relevant qualifications and experience. It may be completed in one year of full-time study, or 3 years part-time.

The academic year begins in September. Inquiries about course content, fees and other administrative details, as well as requests for application forms, should be addressed to:

The Administrative Assistant
Departement of Adult & Higher Education
The University
Manchester M13 9 PL / UK

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The theme of the **IVth International Congress of the World Federation of Public Health Associations (WFPHA)**, to be held from 19 to 24 February, 1984, is *"Quest for Community Health: Experiences in Primary Health Care".* The focus is on lessons learned since the WHO/UNICEF International Conference on Primary Health Care, held at Alma-Ata, USSR, in 1978. In particular, what has been learned in the following areas will be examined:
- assessing needs and evaluating services
- organizing, managing and financing programmes
- developing human resources
- promoting personal, family and community involvement, and
- integrating PHC with other services.

Co-sponsored by WHO and UNICEF, the WFPHA Congress will be held in Tel-Aviv, Israel. Participation is open to all.

Registration fees (for participants):
Until 19 November 1983: US$ 150.—
After 19 November 1983: US$ 180.—

Information on registration, the programme content and transportation packages available can be obtained from:

WFPHA Secretariat
c/o American Public Health Association
1015 15th Street, N.W.
Washington, D.C. 20005 / USA

* * *

A useful tool in any survey of child malnutrition is the measurement of **arm circumference.** Various devices have been used to do this, including different versions of a coloured strip, or bracelet. The former can be made by health workers, for example, out of old X-ray films or knotted string. Ready-made versions also exist.

Teaching Aids at Low Cost (TALC) in the UK now sells an *Echeverri Tape Kit,* consisting of one plastic measuring tape and marker, 20 growth charts with which it can be used, and an instruction sheet. One end of the tape is wide and has a slot in it. The other end is narrow and marked in centimeters. A marker moves along the narrow part of the tape, which is designed to measure arm circumference of children from birth to 6 years old.

Price: £ 2.00 plus 50p postage and packing.

For more details on these materials, write to:

TALC
PO Box 49
St Albans
Herts. AL1 4AX / UK

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A series of six **filmstrips,** guide script book and poster set **on medicinal plants** has been developed by World Neigbors in order to:

- promote interest in the use of medicinal plants and traditional medical practices,
- stimulate a systematic, more scientific approach to the identification and use of medicinal plants, based on local resources and experiences,
- describe the use of medicinal plants by traditional medicine practitioners in the Philippines today.

The 6 strips look at:

1. The Role of Traditional Medicine
2. Aromatic Plants
3. Plants which work on the Stomach and Intestines
4. Plants which are both Food and Medicine
5. Plants with Powerful Action
6. Methods of Preparation.

Altogether, the 6 strips contain 213 full-colour, horizontal frames which are numbered consecutively so that they can be mounted and used as slides.

Prices, (including surface postage):

6 filmstrips, user's guide/script book:	US$ 50.00
Individual strips:	US$ 9.50

Inquiries and requests should be addressed to:

World Neighbors
Development Communications
5116 North Portland Avenue
Oklahoma City, Okla. 73112
USA

NEW PUBLICATIONS

Teknologi Kampungan, by Craig Thorburn
1982, 154 pages

Abundantly and beautifully illustrated, this book was produced by the Indonesian Institute for Social and Economic Research, Education and Information. The tools and technologies described are in the fields of agriculture, fishing and aquaculture, food processing and cooking, water supply, transport, housing, small industries and handicrafts. A conviction that "The best way to become familiar with factors determining the types of technologies appropriate to a given situation is to study the technologies already produced and used there", and that "Probably, the development worker will discover that he has more to learn from the villagers than the villagers have to learn from him" is the book's underlying philosophy.

Price: US$ 5.00

Inquiries and requests should be addressed to:

Appropriate Technology Project
Volunteers in Asia
PO Box 4543
Stanford, CA 94305 / USA

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MEDEX Primary Health Care Series

Information on this series appeared in the June 1983 issue of CONTACT (No. 73). Since then, a new price list has been issued. The cost of the whole set of 35 manuals/materials has dropped from US$ 300.— to $ 145.— including packaging and surface mail: the Systems Development materials cost $ 35.— as do the Operations Management Materials; the price of the Mid-Level Health Worker Training Materials is $ 95.— and of the Community Health Worker Training Materials $ 40.—. Since the numbering of the set has also been slightly modified, inquiries and orders should indicate the relevant title(s) of the particular manuals/training material(s) in question.

Inquiries and (prepaid) orders should be directed to:

The MEDEX Group
John A. Burns School of Medicine
University of Hawaii
1833 Kalakaua Ave., Suite 700
Honolulu, Hawaii 96815-1561 / USA

Cheques should be made out to "The MEDEX Series" and be payable in US dollars.

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